

## CLAIMS

What is claimed is:

- 5           1.    An implantable device for controlling the internal  
circumference of an anatomic orifice or lumen, comprising:  
          an annular ring;  
          means by which said annular ring can be fastened to the tissue  
          around an anatomic orifice or lumen;  
10          means associated with said annular ring for permitting  
          adjustment of the circumference of said annular ring from a  
          first circumference to a second circumference; and  
          means associated with said annular ring for maintaining said  
          ring in said first circumference and, upon said annular ring  
15          being adjusted to said second circumference, for maintaining  
          said annular ring in said second circumference;  
          whereby the circumference of said anatomic orifice or lumen  
          can be adjusted by adjusting the circumference of said  
          annular ring from said first circumference to said second  
20          circumference.
2.    The implantable device of Claim 1, wherein said means  
          by which said annular ring can be fastened to the tissue around an  
          anatomic orifice or lumen comprises a plurality of barbs extending  
25          from said annular ring for engaging the tissue around said anatomic  
          orifice or lumen.
3.    The implantable device of Claim 2, wherein each of said  
          barbs is oriented in a consistent, tangential direction with respect to  
30          the annular ring such that rotational motion of the annular ring in a  
          first direction will engage said retention barbs with the desired tissue,  
          and rotational motion of the annular ring in a direction opposite to  
          said first direction will disengage said retention barbs from said  
          desired tissue.

4. The implantable device of Claim 3, wherein each of said barbs further comprises a hook at its free end.

5           5. The implantable device of Claim 1, wherein said means  
by which said annular ring can be fastened to the tissue around an  
anatomic orifice or lumen comprises an outer fabric sheath covering  
said annular ring through which sutures can be placed to suture said  
implantable device to said tissue around said anatomic orifice or  
10 lumen.

6. The implantable device of Claim 1, wherein said means  
by which said annular ring can be fastened to the tissue around an  
anatomic orifice or lumen comprises a plurality of grommets spaced  
15 around the periphery of said annular ring.

7. The implantable device of Claim 6, wherein said  
grommets have narrowed intermediate neck portions around which  
sutures can be placed and then through the underlying tissue to  
20 anchor said annular ring to the tissue around said anatomic orifice or  
lumen.

8. The implantable device of Claim 6, wherein said  
grommets are comprised of a material which is sufficiently soft that a  
25 suture can be placed through said grommet and through the  
underlying tissue to anchor said annular ring to the tissue around said  
anatomic orifice or lumen.

9. The implantable device of Claim 6, wherein said  
30 grommets comprise tabs comprised of a material which is sufficiently  
soft that a suture can be placed through said tab and through the  
underlying tissue to anchor said annular ring to the tissue around said  
anatomic orifice or lumen.

10. The implantable device of Claim 6, wherein said grommets comprise tabs, and wherein said tabs define holes through which a suture can be placed and then through the underlying tissue to anchor said annular ring to the tissue around said anatomic orifice or lumen.

11. The implantable device of Claim 1, wherein said means associated with said annular ring for permitting adjustment of the circumference of said annular ring from a first circumference to a second circumference comprises corrugations.

12. The implantable device of Claim 6, wherein said device comprises alternating sections of corrugations and grommets spaced around the periphery of said annular ring.

13. The implantable device of Claim 1, wherein said annular ring comprises a hollow tube formed into an annular shape, said tube having interspaced smooth and corrugated sections disposed around its circumference, wherein said means by which said annular ring can be fastened to the tissue around an anatomic orifice or lumen comprises said tube being sufficiently soft such that a suture can be passed through said tube and hence through the underlying tissue; wherein said means associated with said annular ring for permitting adjustment of the circumference of said annular ring from a first circumference to a second circumference comprises said corrugated sections; and

wherein said means associated with said annular ring for maintaining said ring in said first circumference and, upon said annular ring being adjusted to said second circumference, for maintaining said annular ring in said second circumference comprises said corrugated sections being sufficiently stiff that once said annular ring is placed in a given configuration, it will tend to remain in said given configuration when acted upon by normal anatomic forces at said selected anatomic orifice or lumen.

14. The implantable device of Claim 1,

wherein said annular ring comprises a hollow tube formed into an annular shape, said tube having interspaced smooth and corrugated sections disposed around its circumference,

wherein said means by which said annular ring can be fastened to the tissue around an anatomic orifice or lumen comprises said tube having portions of narrowed circumference such that a suture can be passed around said tube at said portions of narrowed circumference and hence through the underlying tissue;

wherein said means associated with said annular ring for permitting adjustment of the circumference of said annular ring from a first circumference to a second circumference comprises said corrugated sections; and

wherein said means associated with said annular ring for maintaining said ring in said first circumference and, upon said annular ring being adjusted to said second circumference, for maintaining said annular ring in said second circumference comprises said corrugated sections being sufficiently stiff that once said annular ring is placed in a given configuration, it will tend to remain in said given configuration when acted upon by normal anatomic forces at said selected anatomic orifice or lumen.

15. The implantable device of Claim 1, wherein said means associated with said annular ring for permitting adjustment of the circumference of said annular ring from a first circumference to a second circumference comprises:

5       teeth formed on at least a portion of said annular ring;  
a gear engaging said teeth of said annular ring; and  
said gear and said teeth being arranged such that turning said gear effects relative movement between a first end of said annular ring and a second end of said annular ring to adjust  
10       the circumference of said annular ring from a first circumference to a second circumference.

16. The implantable device of Claim 15, further comprising a wheel positioned tangentially to said gear such that said portion of  
15       said annular ring which engages said gear passes between said gear and said wheel.

17. The implantable device of Claim 15, wherein said gear is mounted in fixed relation to said second end of said annular ring, and  
20       wherein said teeth are formed adjacent said first end of said annular ring.

18. The implantable device of Claim 15, further comprising means for turning said gear from a location remote from said gear,  
25       such that said circumference of said implant can be adjusted after closure of surgical incisions and resumption of physiological flow through said orifice or lumen.

19. The implantable device of Claim 18, wherein said means  
30       for turning said gear from a remote location is disengageable from said gear after completion of adjustments.

20. The implantable device of Claim 1, wherein said means associated with said annular ring for permitting adjustment of the circumference of said annular ring from a first circumference to a second circumference comprises:

- 5 a worm gear; and  
means operatively associated with a first end of said annular ring for engaging said worm gear such that rotation of said worm gear effects relative movement between said first end of said annular ring and a second end of said annular ring to  
10 adjust the circumference of said annular ring from a first circumference to a second circumference.

21. The implantable device of Claim 20, wherein said worm gear has a first angled gear head at its driven end, and further  
15 comprising a shaft in offset relation to said worm gear and having a second angled gear head at a first end thereof, said first and second angled gear heads drivably engaging such that rotation of said shaft drives said worm gear.

22. The implantable device of Claim 21, further comprising  
20 means for turning said shaft from a location remote from said worm gear, such that said circumference of said implant can be adjusted after closure of surgical incisions and resumption of physiological flow through said orifice or lumen.

23. The implantable device of Claim 22, wherein said shaft  
25 and said means for turning said shaft from a remote location are disengageable from said worm gear after completion of adjustments.